

HANDHELD COMPUTER BASED SYSTEM FOR COLLECTION, DISPLAY AND ANALYSIS OF ENGINE/VEHICLE DATA

FIELD OF THE INVENTION

[0001] The present invention relates to a system and method which employ a handheld computer to collect, display and upload engine/vehicle data to a personal computer for analysis.

BACKGROUND OF THE INVENTION

[0002] The advantages and benefits associated with extracting, displaying and analyzing data from engine powered equipment, such as vehicles, is well recognized and accepted. Fleet operators can examine the accrued data to determine service needs and improper equipment utilization. Service personnel can use the collected information to identify the cause of any failure, to aid in diagnosis, to predict future failures, to schedule maintenance/repairs, and to correct any problems before an actual failure occurs. Such diagnosis and failure prediction are particularly pertinent to automobiles, trucks and static installations of engine powered equipment, such as diesel powered electrical generators, so that minor problems can be repaired before they lead to catastrophic failures and so that servicing can be scheduled during periods in which equipment will be least affected. Elaborate systems for collecting and intelligently analyzing the data have been developed as disclosed, for example, in U.S. Pat. No. 5,737,215 to Schricker et al.

[0003] Modern electronically controlled vehicles and engines, such as diesel truck engines, are typically equipped with a variety of electronic equipment including for example sensors, electronic fuel control systems, and on-board computer control modules all of which is interconnected by a shared communication path called a data link. Attempts have been made to standardize the protocol used by such data links. For example, the Society of Automotive Engineers (SAE) has adopted data link standards, such as J1708 and more recently J1939, that provide for serial data communication between microcomputer systems in heavy duty vehicle applications. SAE has also adopted a J1587 standard for electronic data interchange between microcomputer systems and heavy duty vehicle applications that specifies the format of data and messages communicated among microprocessors connected to a shared data link. U.S. Pat. No. 5,848,365 includes a fuller discussion of these standards.

[0004] A variety of techniques have been developed for the extraction, storage and analysis of data from vehicle data links. These techniques have included a variety of communication links including direct connections between the vehicle data links and portable computers having specialized software for downloading the data and displaying the data and storing it for subsequent uploading to desk top and networked computer systems for more detailed analysis and comparison. For the convenience of the system users, a variety of specialized portable computers has been developed to communicate with on-board vehicle electronics. For example, U.S. Pat. No. 5,050,080 to Abe discloses a diagnostic system including a portable diagnostic device adapted to be connected through an adapter harness with an on-board computer based system that is connected with a plurality of actuators for controlling various components of an engine,

transmission, suspension system and other vehicular devices. The portable diagnostic device is custom built for the purposes for which it is intended which can add significantly to the cost per unit.

[0005] Handheld computers (also known as personal digital assistants) have become quite popular for a variety of functions relating to maintaining personal calendars, personal expenses, calculations, e-mail and other specialized functions. The popularity of these devices has led to high volume sales that has reduced their per unit development costs and allowed further reduction in prices that has fueled further their popularity. These devices are characterized by specialized display screens and memory configurations and often use stylus based operator input systems rather than key pads to reduce size and weight. To operate devices of this type in the most efficient manner and keep electrical power consumption to a minimum, specialized operating systems have been developed for handheld computers. One of the most popular operating systems is known as the PALM™ O/S operating system developed by 3Com. Various aspects of handheld computer systems developed by 3Com are disclosed in U.S. Pat. Nos. 5,727,202; 5,884,323; 5,900,875 and 6,006,274. Another operating system is known as WINDOWS CE™ developed by Microsoft Corporation. While these operating systems are suitable for the purposes intended, the data handling protocols established by these systems do not, without modification, handle other data protocols such as the SAE 1587 protocol. Moreover, the data port of a typical handheld computer (e.g. RS 232) is not compatible with the type of connector normally employed on a SAE 1708 or 1939 data link system.

[0006] Accordingly, the ubiquitous nature of handheld devices, their convenience, portability, low cost make them desirable as a device for assisting in the extraction, display and upload of engine/vehicle information for transfer, e.g. via the internet, for analysis but their specialized operating system, limited storage and computing capabilities, limited battery life and their limited porting capabilities make them less than ideal.

[0007] Attempts have been made to adapt a handheld computer for the purpose of collecting data. For example, Tescina, Inc. of Fremont, Calif. manufactures a DataGet™ product that allows the collection of gauge values using a Palm™ handheld computer, www.tescina.com. Data is ported from the handheld computer to a personal computer in Microsoft Access®, Microsoft Excel® or tab delimited text files. Tescina provides a data acquisition module consisting of an analog to digital circuit powered by a battery power source mounted in an adapter housing that attaches directly to the Palm™ handheld computer. However this system in no way suggests how to utilize a handheld computer to connect with a data link (such as a J1708 or J1939) to collect, display and upload in an efficient manner that does not require modification of the operating software that could interfere with the other functions for which the operating software of the handheld device was designed.

SUMMARY OF THE INVENTION

[0008] The present invention is directed to an vehicle data system for processing and displaying vehicle data transmitted through a bus connector of a data bus on an electronically controlled engine operating in accordance with a